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(54) **Anti-blocking sand/pigment premix**

(57) In preparing a mix comprising cementitious concrete, mortar or asphalt with one or more powder pigments there is a risk that the adherent pigment will block the pneumatic or mechanical conveying equipment taking it to the mixer. To overcome this problem an anti-blocking premix of sand and pigment is formed before conveying. The premix may be conveyed directly to the mixer or may be bagged for storage.

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

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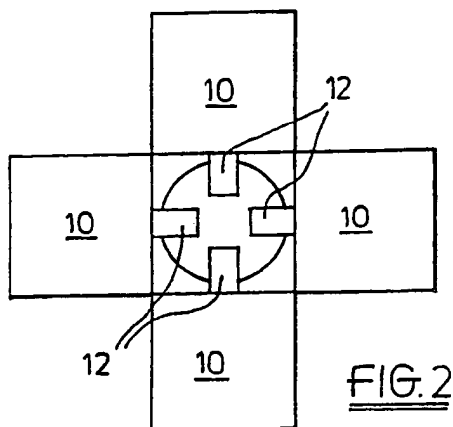
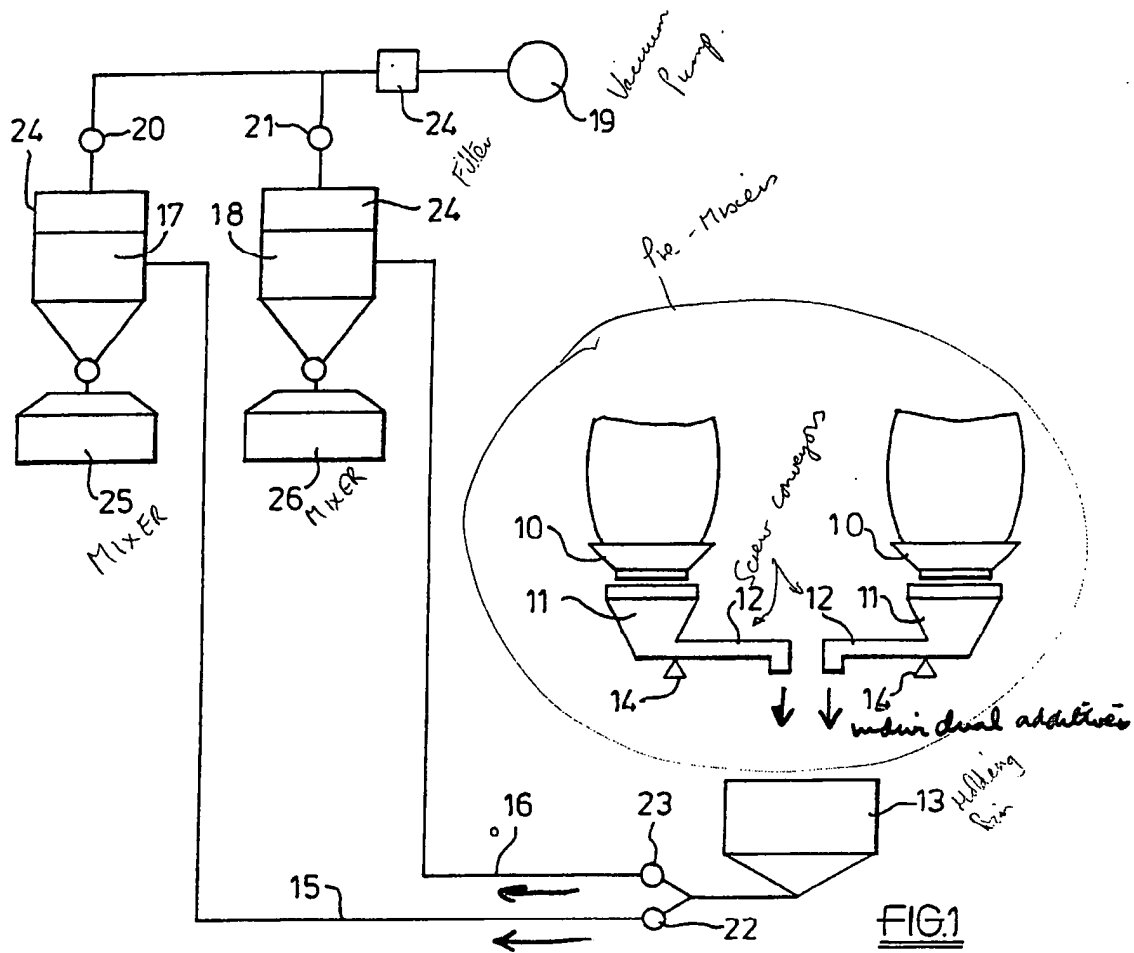


FIG. 2

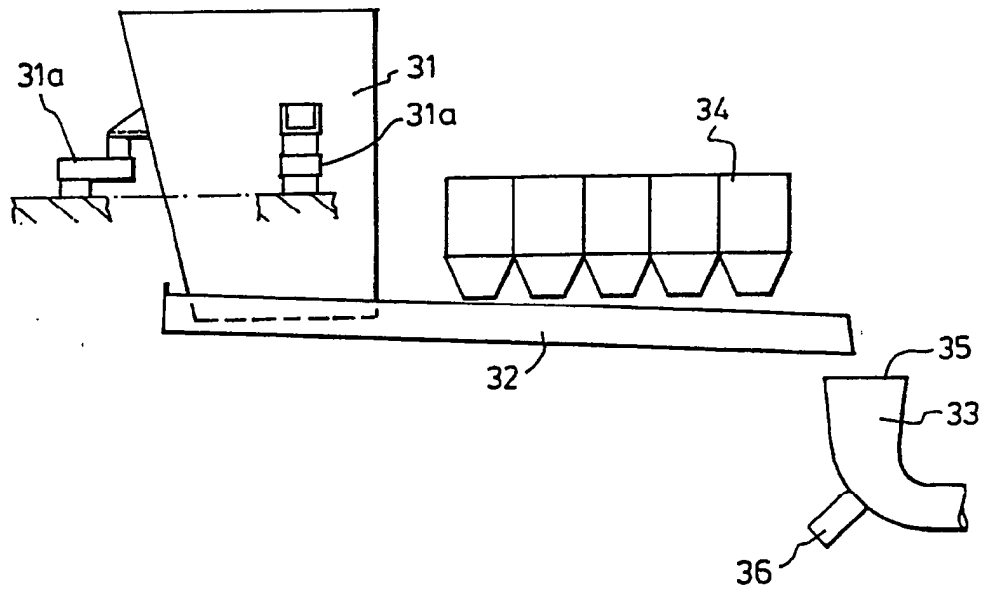


FIG. 3

METHOD FOR PREPARING A MIX

This invention relates to a method for preparing a mix comprising adherent powder material and particulate material using mechanical and/or pneumatic conveying equipment at risk of blocking by the powder material. The invention is particularly useful in connection with the preparation of cementitious concrete, mortar or asphalt mixes containing one or more powder pigments.

Powdered pigments are notoriously difficult materials to handle and readily block pneumatic and mechanical conveying lines. For this reason, the pigments are processed by their manufacturers to enable them to be presented in a granular form which does not have the problems associated with untreated powders. However, such treatment is costly, typically doubling the price of the pigment.

Moreover, the granular material can, through handling, itself partly revert to powder form, and then requires special measures to avoid the powder fraction blocking the conveyor means.

DE-38 34 191-A discloses an arrangement for automatically dispensing, to cement and mortar mixes, dry pigment in granular form but of which a fraction is of diameter substantially smaller than 1mm. Pigment is dispensed from a holding silo through an outlet duct into a weighing hopper via coarse-and fine-feeding dispensers. From the weigh container the pigment drops to an inlet to a pneumatic hose. For pigments which are difficult to feed pneumatically, sand can be added to the pigment

stream in the region of the weighing container. The precise arrangements for adding sand to the pigment stream are not disclosed, and it is clear that substantial modification, the nature of which is not even hinted at, would need to be made to the equipment for this purpose. Moreover, as the sand is introduced in the region of the weighing hopper, it will either not be weighed at all or it will be weighed along with the pigment and only the total weight of pigment and at best added sand will be known, which will introduce uncertainties into the final mix ratio, unless only such small quantities of sand are to be added as will have no effect on fully powdered pigment.

The present invention provides methods and apparatus for preparing a mix of the materials in question which do not suffer from these problems.

The invention comprises a method for preparing a mix comprising adherent powder material and particulate material using mechanical and/or pneumatic conveying equipment at risk of blocking by the powder material comprising preparing a pre-mix of all the powder material and at least some of the particulate material before introduction of the powder material to the conveying equipment, such premix being in such known proportions as will be handleable by the equipment without risk of blocking.

The powder material may comprise a pigment, while the particulate material may comprise sand, but, of course, the method is generally applicable to powders and particulates of other materials. The method is, however, particularly well adapted to preparing a cementitious concrete, mortar or asphalt mix.

The method may in particular comprise the steps of :

- a) dispensing the powder material in measured quantity to a holding bin;
- b) dispensing particulate material to said holding bin;
- c) conveying the content of said holding bin pneumatically to a mixer; and
- d) adding further particulate material to said mixer.

The content of the holding bin may be conveyed by suction.

The materials may be fed to the holding bin from hoppers by means of screw conveyors, which may be controlled in response to weight loss from the hoppers. The weight loss may be sensed by load cells on which the hoppers are mounted.

The hoppers may be supplied by big bag dischargers or by bin dischargers.

More than one adherent powder may be dispensed to the holding bin, which may itself supply a plurality of mixers by valve arrangements.

In another arrangement, particulate material may be dispensed to move towards pneumatic conveying equipment and then powder material dispensed on to said

moving particulate material. Both materials may be dispensed from loss-in-weight feeders.

The materials may slide down an inclined chute to said pneumatic conveying equipment, or on a belt or like conveyor. Said materials may then drop into an upwardly-directed open end of a suction pipe, which may have a vibrator arrangement.

The invention also comprises a mix prepared by a method as described and also comprises a pre-mix comprising powder and particulate material used in a method as described. The premix may be bagged, so that it may be fed straight into a pneumatic conveyor, or a mechanical conveyor likely to be blocked by pure powder pigment. This obviates the need to provide special equipment at the mixing plant where the concrete, mortar or asphalt mix is prepared.

Suitable pigment : sand ratios are between 4:1 and 1:1, lower density pigments needing relatively more sand. Ratios outside this range could, of course, be used. For bagged pre mix which is to be transported to a concrete mixing plant it would be uneconomic to use larger amounts of sand than necessary.

The invention also comprises apparatus for preparing a mix comprising adherent powder material and particulate material using mechanical and/or pneumatic conveying equipment at risk of blocking by the powder material, comprising pre-mixing means for preparing a pre-mix of all the powder material and at least some of the particulate material before introduction of the powder material to the conveying

equipment in known proportions such that the pre-mix will be handleable by the equipment without risk of blocking.

The apparatus may comprise:

- a) a holding bin;
- b) powder material dispensing means dispensing the powder material in measured quantity to said holding bin;
- c) particulate material dispensing means dispensing the particulate material in measured quantity to said holding bin;
- d) conveying means conveying the content of the said holding bin pneumatically to a mixer; and
- e) particulate material dispensing means dispensing any further particulate material required to said mixer.

Embodiments of apparatus and methods for preparing a mix according to the invention will now be described with reference to the accompanying drawings, in which :

Figure 1 is a diagrammatic side elevation of a first embodiment,

Figure 2 is a diagrammatic plan view of a detail of Figure 1, and

Figure 3 is a diagrammatic side elevation of a second embodiment.

The drawings illustrate apparatus for preparing a mix comprising adherent powder material and particulate material using mechanical and/or pneumatic conveying equipment 15, 16, 19, 33 at risk of blocking by the powder material, comprising pre-mixing means 10, 11, 12, 13, 14 for preparing a pre-mix of all the powder material and at least some of the particulate material before introduction of the powder material to the conveying equipment 15, 16, 19, 33 in known proportions such that the pre-mix will be handleable by the equipment without risk of blocking.

Figures 1 and 2 illustrate a plant comprising a plurality (in this example four) of big bag dischargers 10 each able to supply a hopper 11 situated therebeneath.

Three of the dischargers 10 supply different powdered pigments whilst the fourth supplies sand.

Screw conveyors 12 are provided to dispense the contents of the hoppers 11 in measured quantities to a holding bin 13. The screw conveyors 12 are controlled by a micro-processor (not shown) in response to loss of weight from the hoppers 10 sensed by load cells 14 upon which the hoppers 10 are mounted.

The contents of the holding bin 13 may be conveyed through one or other of two lines 15 and 16 to one or other of two bin dischargers 17 and 18 by vacuum

suction. A vacuum pump 19 is provided for exhausting the selected bin. Selection valves 20 and 21 are provided between the pump 19 and bins of the dischargers 17 and 18 and further selection valves 22 and 23 are provided in the lines 15 and 16. Filters 24 are provided to ensure that the conveyed material is retained within the system.

Each of the bin dischargers 17 and 18 feeds an associated mixer 25 and 26 respectively to which the remaining ingredients required for the mix including the balance (if any) of the sand are added.

Figure 3 illustrates a particulate material dispenser 31 dispensing particulate material on to a material moving arrangement 32 which moves it towards pneumatic conveying equipment 33 and powder material dispensing means 34 dispensing powder material on to particulate material moving towards said equipment 33.

Said material moving arrangement 32 may be simply an inclined chute or a belt or like conveyor which drops the material into a upwardly directed open end 35 of a suction pipe of the equipment 33 which is provided with a vibrator 36.

The powder dispensing means ³⁴~~36~~ comprises five loss-in-weight dispensers and the particulate material dispenser 31 is also a loss-in-weight dispenser mounted on load cells 31a.

We have found that the mixture of pigment powders and sand can be conveyed pneumatically with ease and further that the act of conveying by vacuum suction serves to blend the pigments and sand thoroughly.

Thus the invention includes within its scope intermediates for use in preparation of cementitious concrete, mortar or asphalt mixes comprising mixtures of powdered pigment and sand. Such may be prepared at a central facility and bagged for use elsewhere.

It will be appreciated that it is not intended to limit the invention to the above example only, many variations being possible, such as might readily occur to one skilled in the art, without departing from the scope thereof as defined by the appended claims.

Thus, for example fewer or more than three pigment powders may be dispensed to the holding bin which may be adapted to discharge into a single or selected one of more than two process lines.

Where reference has been made simply to "pneumatic" herein it is to be understood as also referring to mechanical conveyor arrangements which are prone to blocking by powder bridging.

CLAIMS

1. A method for preparing a mix comprising adherent powder material and particulate material using mechanical and/or pneumatic conveying equipment at risk of blocking by the powder material comprising preparing a pre-mix of all the powder material and at least some of the particulate material before introduction of the powder material to the conveying equipment, such pre-mix being in such known proportions as will be handleable by the equipment without risk of blocking.
2. A method according to claim 1, in which the powder material comprises a pigment.
3. A method according to claim 1 or claim 2, in which the particulate material comprises sand.
4. A method according to any one of claims 1 to 3, being a method for preparing a cementitious concrete, mortar or asphalt mix.
5. A method according to any one of claims 1 to 4, comprising the steps of:
 - a) dispensing the powder material in measured quantity to a holding bin;
 - b) dispensing particulate material to said holding bin;

- c) conveying the content of said holding bin pneumatically to a mixer; and
 - d) adding further particulate material to said mixer.
6. A method according to claim 5, in which the content of the holding bin is conveyed by suction.,
7. A method according to claim 5 or claim 6, in which the materials are fed to the holding bin from hoppers by means of screw conveyors.
8. A method according to claim 7, in which the screw conveyors are controlled in response to weight loss from the hoppers.
9. A method according to claim 8, in which the weight loss is sensed by load cells on which the hoppers are mounted.
10. A method according to any one of claims 7 to 9, in which the hoppers are supplied by big bag dischargers.
11. A method according to any one of claims 7 to 9, in which the hoppers are supplied by bin dischargers.
12. A method according to any one of claims 5 to 11, in which more than one adherent powder material is dispensed to the holding bin.

13. A method according to any one of claims 5 to 12, in which the holding bin supplies a plurality of mixers by valve arrangements.
14. A method according to any one of claims 1 to 4, in which particulate material is dispensed to move towards pneumatic conveying equipment and powder material is dispensed on to said moving particulate material.
15. A method according to claim 14, in which the particulate material and the powder material are dispensed from loss-in-weight feeders.
16. A method according to claim 14 or claim 15, in which the materials slide down an inclined chute to said pneumatic conveying equipment.
17. A method according to claim 14 or claim 15, in which the materials are conveyed on a belt or like conveyor to said pneumatic conveying equipment.
18. A method according to any one claims 14 to 17, in which said materials drop into an upwardly-directed open end of a suction pipe.
19. A method according to claim 18, said suction pipe having a vibrator arrangement.
20. A mix prepared by a method according to any one of claims 1 to 19.

21. A pre-mix comprising powder material and particulate material used in a method according to any one claims 1 to 19.
22. A pre-mix according to claim 21, bagged.
23. Apparatus for preparing a mix comprising adherent powder material and particulate material using mechanical and/or pneumatic conveying equipment at risk of blocking by the powder material, comprising pre-mixing means for preparing a pre-mix of all the powder material and at least some of the particulate material before introduction of the powder material to the conveying equipment in known proportions such that the pre-mix will be handleable by the equipment without risk of blocking.
24. Apparatus according to claim 23, comprising
- a) a holding bin;
 - b) powder material dispensing means dispensing the powder material in measured quantity to said holding bin;
 - c) particulate material dispensing means dispensing the particulate material in measured quantity to said holding bin;
 - d) conveying means conveying the content of the said holding bin pneumatically to a mixer; and

- e) particulate material dispensing means dispensing any further particulate material required to said mixer.

25. Apparatus according to claim 24, in which at least one of said powder and particulate material dispensing means comprises a screw conveyor from a hopper.

26. Apparatus according to claim 25, in which said screw conveyor is controlled in response to weight loss from its hopper.

27. Apparatus according to claim 26, in which said hopper is mounted on load cell means.

28. Apparatus according to any one claims 23 to 27, comprising a big bag discharger for said hopper.

29. Apparatus according to any one claims 23 to 27 comprising a bin discharger for said hopper.

20. Apparatus according to claim 28 or claim 29, comprising a plurality of big bag and/or bin dischargers arranged to feed said holding bin.

31. Apparatus according to claim 23, comprising a particulate material dispenser dispensing particulate material on to a material moving arrangement which moves it towards pneumatic conveying equipment and powder material dispensing

means dispensing powder material on to particulate material moving towards said pneumatic conveying means.

32. Apparatus according to claim 31, in which said material moving arrangement comprises an inclined chute.
33. Apparatus according to claim 31, in which said material moving arrangement comprises a belt or like conveyor.
34. Apparatus according to any one claims 31 to 33, in which said material moving arrangement drops the material into an upwardly-directed open end of a suction pipe.
35. Apparatus according to claim 34, in which said pipe has a vibrator arrangement.

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Search Examiner
MR N A FRANKLIN

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(HAC, HPM, HPX)

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24 OCTOBER 1995

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

Documents considered relevant following a search in respect of Claims :-
1-35

X:	Document indicating lack of novelty or of inventive step.	P:	Document published on or after the declared priority date but before the filing date of the present application.
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A:	Document indicating technological background and/or state of the art.	&:	Member of the same patent family; corresponding document.

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